

AMENDMENTS TO THE CLAIMS

The following **Listing of Claims** replaces all prior versions and listings of claims in this application. Please amend claims 4, 6, 11, 12, 15, 19 and 20. Please cancel claim 8.

LISTING OF CLAIMS

Claim 1 (Canceled)

Claim 2 (Withdrawn): A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising;

a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of activating the nitrogen-including gas and causing the activated nitrogen-including gas to react with metallic contaminant contained in a member in the reaction chamber so as to remove the metallic contaminant from the member.

Claim 3 (Withdrawn): A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising;

a deposit-removing step of removing a deposit stuck to an inside of the film-forming unit by supplying into the reaction chamber a cleaning gas that includes fluorine, and

a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of activating the nitrogen-including gas and causing the activated nitrogen-including gas to react with the fluorine diffused into a member in the reaction chamber during the deposit-removing step, so as to remove the fluorine from the member.

Claim 4 (Currently amended) A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising:

a deposit-removing step of removing a nitride deposit stuck to an inside of the film-forming unit by supplying into the reaction chamber a cleaning gas that includes fluorine, and

a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of nitriding a surface of a member in the reaction chamber by activating the nitrogen-including gas, the nitride deposit-removing step and the purging step being in predetermined time sequence in the following order according to a recipe, the recipe comprising, for the nitride deposit-removal step, loading at normal first predetermined pressure to seal the film-forming unit, stabilizing at a first predetermined temperature range of approximately 300° C, cleaning at a maximum predetermined first vacuum pressure range at a pressure between 100.0 Torr and 400.0 Torr by introducing the cleaning gas that includes fluroine and, for the purging step, stabilizing, ammonia purging at a second, higher predetermined temperature range by increasing the temperature to a temperature within a range between 600° and 1050° C and at a third second predetermined vacuum pressure range between normal and maximum predetermined pressure ranges of less than 100 Torr, stabilizing and unloading at said first predetermined temperature range and normal said first predetermined pressure.

Claim 5 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the nitrogen-including gas is ammonia, dinitrogen monoxide or nitric oxide.

Claim 6 (Currently amended): A cleaning method of a film-forming unit according to claim 4, wherein

during the purgingnitride deposit-removing step, the inside of the reaction chamber is maintained at a range of 133 Pa to 53.3 kPa vacuum pressure of approximately 150 Torr and a temperature of approximately 300° C by a controller, connected to a heating unit and to different gas supply units, the controller for measuring temperature and pressure at a plurality of positions of said film-forming unit.

Claim 7 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

during the purging step, the nitrogen-including gas is supplied into the reaction chamber heated to a predetermined temperature of approximately 900° C in order to be activated responsive to a controller for measuring temperature and pressure at a plurality of positions of said film-forming unit.

Claim 8 (Cancelled).

Claim 9 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the member in the reaction chamber consists of quartz.

Claim 10 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the process gas comprises ammonia and a silicon-including gas,
the thin film is a silicon nitride film, and
the nitrogen-including gas is an ammonia gas.

Claim 11 (Currently amended): A film-forming method for use in a film-forming unit comprising

~~a cleaning step of cleaning a film-forming unit in accordance with a cleaning method of a film-forming unit according to claim 4, and~~

a film-forming step of heating the inside of the reaction chamber containing the object to be processed to a predetermined temperature between 600° C and 1050° C and a predetermined vacuum pressure of less than 1 Torr, and forming a thin film on the object to be processed by supplying a process gas into the reaction chamber, and

a deposit-removing step of removing a nitride deposit stuck to an inside of the film-forming unit by supplying into a reaction chamber a cleaning gas that includes fluorine, and
a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,
wherein the purging step has a step of nitriding a surface of a member in the reaction chamber by activating the nitrogen-including gas, the nitride deposit-removing step and the purging step being in predetermined time sequence in the following order according to a recipe controlled by a controller connected to a heating unit and to a nitrogen-including gas supply unit, the controller for measuring temperature and pressure at a plurality of positions of said film-forming unit, the recipe comprising, for nitride deposit-removal, loading at a first predetermined pressure to seal the film-forming unit, stabilizing at a first predetermined temperature range of approximately 300° C, cleaning at a first vacuum pressure range at a pressure between 100.0 Torr and 400.0 Torr by introducing the cleaning gas that includes fluorine and, for the purging step, stabilizing, ammonia purging at a second, higher predetermined temperature range by increasing the temperature to a temperature within a range between 600° and 1050° C and at a second predetermined vacuum pressure range of less than 100 Torr, stabilizing and unloading at said first predetermined temperature range and said first predetermined pressure.

Claim 12 (Currently amended) A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising:

a nitrogen-including-gas supplying unit that supplies directly into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including-gas, the activating unit being a heating unit, [and]

a nitriding unit that nitrides a surface of a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas, and

a controller, connected to said heating unit and to said nitrogen-including-gas supply unit, for measuring temperature and pressure at a plurality of positions of said film-forming unit and for controlling, according to a recipe, the temperature within the chamber via said heating unit, for controlling a flow of nitrogen-including gas via said nitrogen-including gas supplying unit, and for controlling the nitriding unit in predetermined time sequence in the following order according to said recipe, of loading to seal the film-forming unit and to provide at a first predetermined temperature range of approximately 300° C and normal first predetermined pressure; and stabilizing, then by increasing a temperature to a temperature within a range between 600° and 1050° C for film-forming and reducing the pressure to a first vacuum pressure range of less than 1 Torr, followed by reducing the temperature again to the first predetermined temperature range, where film-forming occurs at a second higher predetermined the temperature range of between 600° and 1050° C and at a first predetermined vacuum pressure range different from of less than 1 Torr normal pressure, the film-forming comprising wafer loading at the first predetermined temperature range and first predetermined pressure, film-forming at a temperature within a range between 600° and 1050° C range, purging and unloading at said first predetermined temperature range and normal said first predetermined pressure.

Claim 13 (Withdrawn): A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising;

a nitrogen-including-gas supplying unit that supplies into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including gas, and

a contaminant-removal controlling unit that removes metallic contaminant from a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-

including gas and by causing the activated nitrogen-including gas to react with the metallic contaminant contained in the member.

Claim 14 (Withdrawn): A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising;

a cleaning-gas supplying unit that supplies into the reaction chamber a cleaning gas that includes fluorine,

a nitrogen-including-gas supplying unit that supplies into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including gas, and

a fluorine-removal controlling unit that removes fluorine from a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas and by causing the activated nitrogen-including gas to react with the fluorine diffused into the member.

Claim 15 (Currently amended) A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising:

a cleaning-gas supplying unit that supplies directly into the reaction chamber a cleaning gas that includes fluorine and that is capable of being activated,

a nitrogen-including-gas supplying unit that supplies directly into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including-gas, the activating unit being a heating unit,

a nitriding unit that nitrides a surface of a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas and the cleaning gas according to a recipe, and

a controller, connected to said heating unit, said nitrogen-including-gas supply unit and said nitriding unit, for measuring temperature and pressure at a plurality of positions of said film-

forming unit and for controlling the temperature within the chamber via said heating unit, for controlling a flow of nitrogen-including gas via said nitrogen-including gas supplying unit, for controlling the flow of cleaning gas via said cleaning-gas supplying unit, and for controlling the nitriding unit in predetermined time sequence in the following order according to said recipe, of loading at a first predetermined temperature range and normal first predetermined pressure to seal the film-forming unit, stabilizing, film-forming at a higher predetermined temperature by increasing the temperature to a temperature within a range between 600° and 1050° C and a second predetermined vacuum pressure range less than 1 Torr, purging and unloading at normal first predetermined pressure and cleaning at a maximum predetermined vacuum pressure range of greater than 100 Torr at the first predetermined temperature range..

Claim 16 (Previously presented): A film-forming unit according to claim 12 or 15, wherein

the nitrogen-including gas is ammonia, dinitrogen monoxide or nitric oxide.

Claims 17 and 18 (Canceled)

Claim 19 (Currently amended): A film-forming unit according to claim 12 or 15, wherein

the heating unit heats the inside of the reaction chamber to a range of 600 °C to 1050 °C responsive to the controller.

Claim 20 (Currently amended): A film-forming unit according to claim 12 or 15, further comprising

a pressure-adjusting unit that maintains said controller maintaining vacuum pressure the inside of the reaction chamber at within the range of 133 Pa to 53.3 kPa, 2 Torr to 400 Torr.

Claim 21 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein the cleaning gas comprises fluorine gas.

Claim 22 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein the thin film is a silicon nitride film.